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REPORT

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FINAL REPORT: ELECTROFISHING SURVEY OF THE GREAT MIAMI RIVER

DATE: 13 September 1988 9/15
and 20-Sept. 1988 9/22

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INTRODUCTION:

This 1988 report is a companion to our report of on status of the fishery of the Great Miami River in mid-Sept. 1987. A complete historical perspective of the fishery of the Great Miaim River is contained threrein(Miller et al. 1987). This 1988 report emphasizes the comparison among the years of the status of the fishery interms of numbers, species richness, diverity indices, biomass, etc. Since the samples were taken within a week of one another over the years 1985-1988, they are as comparable for this level of sampling intensity as they might be. Hence with 5 years of data we may be able to detect trends in the river by station.

The samples were taken for radionuclide analysis of fish filets. Those samples were shipped to It Corporation in Oak Ridge, Tennessee for analysis. All of the fish recovered were identified to species, weighed, and length taken and in adults sex determined. This report details those findings and analyses on the status of the Great Miami R. fishery from above to below the outfalls of the Westinghouse Materials Company of Ohio at Fernald. The fisheries analysis contained in this report is an analysis of the fishery of the Great Miami River at three stations, above and below those areas potentially impacted by WMCO effluents. Moreover, since this is the fourth year of identical surveys in the same month (+- 1 week), a longer term trend in river water quality might be revealed.

If changes in the fish community health or structure were apparent over the 5 years of sampling, changes in species composition, changes in mean or modal size and weight, deviation in length x weight distributions by station, and changes in redundancy might be expected. Stress from water pollution, for example might reduce the number of species, cause one species to become very common or increase redundancy, cause loss of year class, or cause one or more year classes to grow more slowly changing the weight x length distribution, or reduce the species overlap between stations or years. The changes in habitat between stations appears to be the most important determinant of community structure over this time period.

METHODS:

Fish surveys were taken at three prearranged stations: 1) above probable influence of the WMCO facility at River Mile 28 near the Boulton Water Treatment Plant; 2) below the confluence of the WMCO effluent pipe and the Great Miami River at River Mile 24 at Stricker's Grove amusement park; 3) and Welch's Sand and Gravel Co. at River Mile 19.3 below confluence of GMR and Paddy's Run which drains the WMCO property in part.

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Fish were electroshocked with 240 volt , pulsed DC (60 hz), 4-6 amperes of delivered power from a 16 foot electrofishing boat. The boat used a forward anode of 4 vertical cables in the top 4" of water to attract the fish to the surface of the muddy river water. The cathodes were long strands of cable mounted across the front of the boat. The electricity was provided by a 3500 Watt ONAN gasoline generator provided to a pulsed DC electroshocker used at 220 volts and 60 cps. The electricity was controlled to the electrodes by a 'deadman' foot switch. The amperage delivered was controlled by the number and length of anode cable exposed to the water for any given conductivity. Normally 4-6 amperes were delivered between the sets of electrodes. This has been effective at immobilizing fishes between the electrodes and even near the anodes. Many fish species are attracted to the anode. When the fish lose equilibrium in the current, the flash of the white belly is visible even under the murky water, so that the two persons equipped with long handled dip nets could retrieve most of the stunned fish.

Each station was fished for 35, 34.2, and 60 minutes at stations 1,2 and 3,respectively. These are the minutes the shocker was actually on (using the foot switch) not the total amount of time spent at each station. Low diversity of fish and inability to capture all types of fish caused us to work nearly twice as long at station 3. The stunned fish were netted by two persons standing behind a railing around the bow of the john boat and placed in a central well. The water in the well was aerated with an air compressor during the shocking in case some of the fish were to be released alive. Some large game fish were released after taking their length and weight. All species except for gizzard shad were taken in proportion to their abundance, with the reservation that small fish were probably under-estimated in the sample.

Physical-chemical measurements taken at each station included dissolved oxygen, conductivity as a measure of total dissolved salts, and secchi depth as a measure of water transparancy. A dissolved oxygen meter (Yellow Springs YSI model 57) was calibrated with air-saturated air. Once set the meter offered good precision for comparison between stations but doubtfull accuracy. The conductivity was measured with a YSI model 33 conductivity meter corrected for temperature. The secchi depth was determined by the depth under the water that a 22 cm white disk disappears to the observer from above. An oxygen depression below saturation at the ambient temperature may be an indication of decomposition of excess organic matter in the river, presumably from sewage. A high conductivity above about 600 umhos/cm might indicate the addition of soluble salts as in sewage over that. which might be supported by water dissolving limestone in equilibrium with CO_2 in air.

The fish were identified to species, weighed to nearest 1 gm, and measured for length to the nearest 0.1 cm. Verification of the identification of a particular fish was completed in the laboratory using the appropriate keys (Trautman 1981. Fishes of Ohio, O.S.U. Press, Columbus and W.L. Pfleiger. 1975. The Fishes of Missouri. Missouri Dept. Conservation.) The fish were placed on ice in plastic bags, labelled and returned to the University of Cincinnati. In the afternoon of the day the fish were collected, their sex was determined by autopsy and they were cleaned for radionuclide analysis. To determine sex, the fish were opened and sex organs examined where they lay along the dorsal wall of the abdomen. Gravid females could be easily told by the size, color and condition of eggs. Immatures and males were the most difficult to assess. To prepare filets, the heads, tails and dorsal fins were removed. The viscera and swim bladder were removed. All fish were placed into plastic bags in quantities of 100-500 gms, labelled as to station, species, and wet weight and frozen at -20C. Often with uncommon species that were closely related in our collection, eg carpsuckers, several different species from the same group which might gather food in the same manner (predator, herbivore, detrivore) were placed in the same bag to make a minimum weight. The entire area was cleaned up of fish parts and liquids between stations so that no cross contamination could occur. The laboratory used for cleaning the fish at the University of Cincinnati was a laboratory in which no radionuclides had ever been used. Each package of fish was given a uniques sample number and inventoried on our computer and on WMCO Enviornmental Saftey and Health Analytical Data Sheet. Copies of both were sent to WMCO before the fish were shipped for analysis. Upon clearance from WMCO, the frozen fish were placed in styrofoam coolers with 10 lbs of dry ice, re-inventoried, and shipped with one day guaranteed delivery by Federal Express to the It Corporation in Oak Ridge, Tennessee for Uranium analysis. The inventory for each cooler (one cooler per station) was included in the shipment and one copy sent to WMCO. In all 66 packages of filets were sent from all three stations.

EXPERIMENTAL STATIONS: Three stations have been used for electrofishing every year since 1985 at the same time of year, namel late summer. The first station in the Great Miami River is at river mile 28 at the Boulton Water Works of the city of Cininnati. The site is a straight section of shallow pool below a sharp curve and above a small rapids. A backwater thumb projects from the section of pool behind a bar above the rapids. The shores of the thumb and river on both sides are covered with overhanging riparian vegetation with many treefalls into the river. Several snags on the bottom, make this the best habitat for fish using the criteria of Yoder and Gammon (1976) found on the Wabash and the Ohio River. The pool is cobble covered, the sides are moderately steep and rocky on the eastern shore. The current in the river section here is faster than that at station 3 and slower than that at station 2.

The second station is at river mile 24 at Strickers' Grove Park where the outfall pipe from the WMCO facitility enters the river. The mixing zone is in a deep, fast section of river with strong eddy currents just below. The eastern shore is good habitat with complex shoreline, snags, and deep. The western shore is poor habitat, the inside of a curve with a depositional environment, shallow and with no vegetation. The fastest current was found here on the outside of a long curve in a narrow section of channel. These conditions selected against small fish. Here we found the greatest size and highest diversity of unusual fish over the year including blue catfish, many carpsuckers, gar, etc. not found at other stations. These are the characteristic fish of large deep rivers.

The third station was located at river mile 19.3 at the junction of Paddys' Run Creek and the Great Miami River, at the site of Welch's Sand and Gravel Company. The Paddys' Run receives any and all surface drainage from the WMCO facility and surrounding land. The small creek has never been running during any of our sample periods in five years. The station is a large deep pool created by sand and gravel draglines removing the annual, winter accumulation. The pool is located below a rapids in part generated by old bridge abutments there and a dam encasing a major gas main. In 1985, the water flowed over a large iron pipe, exposed to damage. In 1986, the pipe had been buried under a massive dam of rock,cobble, cement bouulders etc., that effectively eliminated any upstream fish movement duirng the low water periods. In 1987, most of the dam had been removed and fish probably could pass. Because of the severe drought in 1988, the dam was again a likely barrier to upstream dispersal. This station had the slowest flow over the reach electroshocked and was truely pond-like in 1988.

RESULTS

Physical-chemical data from collection dates 15 and 22 Sept. 1988 showed a pattern of decreasing conductivity from upriver to Paddy's run (TABLE 1), presumably as recent surface runoff contributed to diluting the flow in tributaries between station 1 and 2. In part, the release of water treatment chemicals at the Boulton Water Treatment Plant of Cincinnati may have contributed to the higher conductivity upriver. The slight increase at station 3 a week later was coincident with observed decrease of flow over the period. The oxygen was highest a station 2 at midday, reaching 111% of saturation, consistent with the diurnal production by attached algae (Cladophora) and aquatic plants (Myriophyllum, Potomogeton) which covered rocks and soft sediments in quiet waters in September. The drought and low flow in the summer of 1988 allowed macrophytes (aquatic angiosperms) to invade the river channel, more than any previous year. The lower oxygen saturation upriver was either caused by time of day in early morning or by higher community respiration up river. The secchi depth, as the depth at which a white 22 cm diameter disk disappears, is a sensitive indicator of turbidity in the river. In the active gravel/sand mining area around Paddy's Run, the visibility through the water was reduced by 2/3, even as the river flow was dropping.

We electroshocked the stations for 35, 34.2 and 60 minutes at stations 1,2 and 3, respectively. The number of fish caught by station increased downriver from 85, 111, and 154 fish at stations 1, 2, and 3, respectively (Table 2). We electroshocked for twice as long (60 min) at station 3. The number of fish recovered per hour of electroshocking was more similar than the totals caught (146, 195, vs 154 ind/hour, respectively), and the abundances at stations 1 and 2 became higher than station 3. The susceptibility of fish to shocking varys with the topography of the shore, the depth of pools and nature of currents, and the amount of vegetation overhanging the river, and clarity of the water (Yoder & Gammon 1976). Station #2 had some excellent habitat on the western shore with relatively high current velocity close to shore. Station #3 was disturbed by gravel removal operations however the diversity of fish were found on the undisturbed shore, not on the barren, recently disturbed shore. Station #1 was good habitat with simply lowered diversity. Some effluents from the water treatment plant were seen, creating a delta of alum used to sediment silt in water treatment.

In 1988 we captured 350 individual fish at three station from 25 species in 9 families (TABLE 2). The most diverse family was the Centrarchidae (sunfish and black bass) with 11 species. The numbers of species per station ranged from 13 to 15. There was a shift from gizzard shad dominated communities up river to a sunfish/shad-dominated community at station 3, Paddy's Run (TABLE 2). The most numerous fish is the river was the gizzard shad (n= 173 of 350 fish); followed by longear sunfish, bluegill sunfish, and large mouth bass (n= 21-37). A few of the native suckers (Catastomidae) were found especially at station #2 (Stickers Grove) from deep swift water.

The average number of fish collected over 5 years of similar at 73, 78 and 175 individual, respectively, uncorrected for time of shocking. The number of fish collected/ station was highly significantly different, although there was no difference between years (TABLE 3). The mean number of fish per station ranged from 83 in 1985 to 157 in 1984 and compared to the 116 in this study 1988. The number of species collected (15,12 and 15 at station 1,2 and 3, respectively), was not different by station or year in 1 way ANOVA (TABLE 2). Thus this year was nearly statistically identical to findings over 5 years.

Table 3: NUMBER OF FISH SAMPLED AND NO. SPECIES IDENTIFIED AT EACH STATION BY YEAR, 1984-1988.

	NO. OF SPECIES			NO. OF INDIVIDUALS		
Year/Station	I	II	III	I	II	III
1984	15	12	15	105	105	63
1985	11	19	16	52	42	157
1986	12	15	16	74	78	181
1987	10	11	10	51	56	119
1988	15	13	15	85	111	154
	12.6	14.8	14.2	73.4	78.5	174.8

1 WAY ANOVA SPECIES X YEAR F= 2.02(4,10) p=0.167 NS

1 WAY	ANOVA	SPECIES X STATION	F=	0.57(2,12)	P=0.582	NS
1 WAY	ANOVA	NO.IND X YEAR	F=	0.84(4,10)	P=0.529	NS
1 WAY	ANOVA	NO.IND X STATION	F=	11.28(2,12)	P=0.0018	HS ***

The diversity of fish based upon the numbers recovered, relatively nonselectively was measured by information theory based methods using log base 2. The greater index of diversity is increased by the number of species in a sample and the relative uniformity of the numbers of fish in each of the species. The maximal diversity that can be attained in any sample is fixed by number of species, assuming evenness of the numbers of fish per species. (Table 1). The maximal diversity increases at each station downstream as do the number of species in the sample. The index of diversity was highest at station #3 (2.78) and lowest at station #1 (2.23) (Fig. 2,3). Since station #3 had the greatest number of species, the highest diversity per individual and highest maximal diversity if all species were represented by equal numbers of individuals, the eveness of individuals per species must be most equal here. The gizzard shad and longear sunfish were codominants both doing well in this backwater trapped near the Paddy's Run confluence by the remains of a temporary dam built upriver 0.5 miles to protect a gas pipeline crossing the river. Although ineffectual as a barrier in 1987 at the time of our sampling, the high dam of 1986 and the remenent dam in low flow of 1988 created a pond below it in 1986 & 1988. Station #1 & #2 had lower diversity because of dominance by gizzard shad. The eveness coefficient of actual divided by potential diversity with a given species richness shows the high eveness at station #3 > #2 > #1 (FIG. 3). Over the five years of these studies in September, station 2 was the most diverse and had the highest redundancy. There was no pattern of significant differences in diversity/ individual or eveness by year or by station (TABLE 4).

TABLE 4. SPECIES DIVERSITY AND EVENESS USING SHANNON-WEAVER METHOD (lOG BASE2) BY STATION AND BY YEAR, 1984-1988.

	Hbar/INDIVIDUAL			EVENESS		
YEAR/STATION	I	II	III	I	II	III
1984	2.24	1.70	2.06	0.58	0.48	0.53
1985	2.93	3.82	1.28	0.85	0.90	0.32
1986	2.62	3.40	2.20	0.73	0.87	0.55
1987	1.68	3.07	1.26	0.51	0.89	0.40
1988	2.23	2.33	2.78	0.57	0.63	0.71
Avg.	2.34	2.88	1.92	0.65	0.75	0.50

1 WAY ANOVA	Hbar X YEAR	F=0.61(4,10)	p=0.66	NS
~~1 WAY ANOVA~~	~~Hbar x STATION~~	~~F=3.18(2,12)~~	~~p=0.078~~	~~NS~~
1 WAY ANOVA	EVENESS X YEAR	F=0.41(4,10)	p=0.80	NS
1 WAY ANOVA	EVENESS X STATION	F=3.51(2,12)	p=0.063	NS

We examined the length and weight frequency diagrams for the total catch at each station. The average length was greatest at station 1, 2 and 3 in that order in 1988 (FIG 4). The average weight followed the same pattern (FIG 5). Clearly station #3 had smaller fish on average represented by young of year shad and sunfish. The modal length of stations 1 and 2 was between 24-25 cm while that at station 3 was only 12 cm (FIG. 6, TABLE 3). The modal weight showed the higher number of small fish at station 3 (0-25 g) compared to 2 (100-150 g) and 1 (150-175 gm) (FIG. 7, TABLE 3). Small modal length indicates the strength of reproduction in the young-of-the-year. Large modal length or weight may indicate a pollutional episode decreases reproductive success, or that the habitat is not conducive to a nursery role (eg. fast current, poor substrate, etc.).

Only station 3 had noticibly smaller fish in length and weight in 1988 comapred to 1987. Plotted as the cumulative percent frequency by length and weight the differences between stations are more clear. Station #1 had the highest contribution of large fish, greater than 2 and 3 (FIG.8 & 9). Station #3 had the highest proportion of small fish (< 100 gm or 20.0 cm). In 1988 the weight-frequency distribution of fish was significantly different using the Kolmogorov-Smirnov test between station 1 and 2 (K-S statistic = 0.31, p =0.0001) ; between station 2 and 3 (K-S statistic = .42, p=0.00001) and between 1 and 3 (K-S statistic = 0.60, p=0.00001). Similarly, the cumulative length frequency of fish between all stations were significantly different than each other. For station 1 and 2 (K-S statistic = 0.17), p=0.010; for station 2 and 3 (K-S statistice = 0.26),p = 0.00001; and for station 1 and 3 (K-S statistic = 0.31), p = 0.00001.

TABLE 5. AVERAGE LENGTH AND WEIGHT OF FISHES CAUGHT BY STATION COMPARED BY YEAR, 1985-1988.

	AVG. WT (gms)			AVG. LENGTH (cm)		
YEAR/STATION	I	II	III	I	II	III
1985	623	376	115	23.8	26.3	18.5
1986	471	271	160	30.5	23.3	23.8
1987	180	260	130	26.0	28.0	23.0
1988	175	135	62	25.0	23.5	14.5
Avg.	362	260	117	26.3	23.3	20.0

1 WAY ANOVA	WEIGHT X YEAR	F= 1.51(3,8)	p=0.283	NS	
1 WAY ANOVA	WEIGHT X STATION	F= 25.95(1,22)	p=0.00001	HS	***
1 WAY ANOVA	LENGTH X YEAR	F= 0.93(3,8)	p=0.469	NS	
1 WAY ANOVA	LENGTH X STATION	F= 317.3(1,22)	p=0.00001	HS	***

The average fish was largest at station 1,2 and 3 in that order in 1988 (Table 5). That was the pattern for 1985, 1986 and 1988. Only in 1987 were the fish captured at station #2 larger than those at stations #1 and #3. There may have been a poor year for recruitment in gizzard shad in 1987, since the dominant fish were

2-3 years old. As the river became larger down river and more ponded, the average fish and the distribution became significantly smaller (Table 5). These differences are likely due to habitat being more suitable for recruitment and as a juvenile nursery at station #3 compared to the the faster-flow stations at #1 and #2. The differences in length and weight were different by station , but not different between years (ANOVA, TABLE 5).

What caused the increase in 0-1 year old gizzard shad at station #3 may have been the the low flow allowing near ponding in the pools most of the summer which might favor G.Shad as it does in the lower Ohio River (Pearson and Krumholz 1979). In the deepest and most ponded station, #3 at Paddy's Run the number of small sunfish and gizzard shad dominated. Apparently this habitat may have been as good for nesting fish like the Centrarchids, compared to the gizzard shad with its pelagic dispersal of eggs into the water.

In order to determine if the fish were all growing at the same rate at the three stations, the length x weight relationship of the commonest fish were plotted as functions of weight. Largemouth and smallmouth bass ("5" and "4", respectively on FIG. 10) show no apparent discontinuities between these closely related species. The longear sunfish from station 3, where they were common, is continuous distribution (FIG. 11). The bluegill sunfish from station 1 may be slightly heavier than those from station 3 for a given length (FIG. 12). But station 2 & 3 appear to overlap completely. The commonest species at all three stations, the gizzard shad, overlapped at all three stations, suggesting not differences in growth between stations (FIG. 13). The carp which was rare at station 3 (n=1), similarly shows not difference by station along the weight/length relationship (FIG. 14).

Condition is fatness factor per unit length. Fish in poor condition are longer per unit weight than fish in good condition. Among small fish, especially Y-O-Y, the probability of survival overwinter is a function of condition. This condition factor is a good indicator of stress by late summer. If one station had fish below the length x weight plot for the other two stations, then we might infer that growth conditions were not as good because of a lack of food or pollutional stress. Although the difference in scattergrams was not compared statistically, the fish from all three stations overlap completely across the spectrum of size and length we caught. Often the predators, such as the small and large mouth bass, might be sensitive to the availability of food, especially Y-O-Y shad and sunfish (forage fish).

Changes in community structure may be visualized by comparing the similarity of species composition between stations. The community coefficient is a measure of the proportion of species shared in common betwee any two stations. The community coefficient (CC) is calculated as two times the number of species shared in common between two stations divided by the sum of all species found at those two stations. A CC of 1.0 means the stations have identical composition and a CC of 0.0 means none are shared in common. The more dissimilar two stations are might reflection of differences in the habitats. This could be effected by a pollutant. In 1988, stations 1 and 2 were more similar than station 2 and 3 or 1 and 3 (FIG. 15).

SUMMARY: The fishery in the river has not changed much in the five years of our surveys. The diversity is often highest at station 2, Stickers Grove, because there is no dominance by one species, the gizzard shad or carp. The presence of pools along the river, increases these pool-loving species at stations 1 and 3, Boulton pool and Paddy's Run pool. Density is enhanced at station 3, Paddy's Run pool by the dam which prevents upstream migration during low water. Hence numerous fish are trapped below the dam. Moreover, the continual disturbance on on side of the river at that point by gravel mining, releases large numbers of food items from the gravel/silt bottom. Differences were found in most parameters between stations but not between years. Thus, the health of the fishery of the Great Miami River appears unchanged over the years. The persistent difference between stations is a function of the significant change in habitat from riverine stations 1 and 2, compared to the pooled station 3.

In summary:

1. The highest number of species occured at stations #1 and #3 (15 species).

2. The highest diversity per individual, H', a measure of species richness and equitability, was highest at station #3, Paddy's Run station where forage fish and predators were both common.

3. The highest eveness and the lowest redundancy was found at station #3 in 1988.

4. Most fish at all stations were in good condition, free from congenital growth defects, lesions, and ectoparasites.

5. The smallest fish on average were collected from stations #3,#2,#1, in that order.

6. Conversely, the largest fish were found at station #1,#2, #3 ,in that order.

7. For the most numerous fish, the length/weight curves overlaid each other, meaning that fish condition at all stations was similar.

8. The comparison of means of diversity, species per station, fish per station, average length and weight between stations and years, showed only significant differences between stations, not between years. Thus, the variance is either too high for n = 5 years, or there have been no significant changes in the river that have overtly caused changes in the fish community that we can

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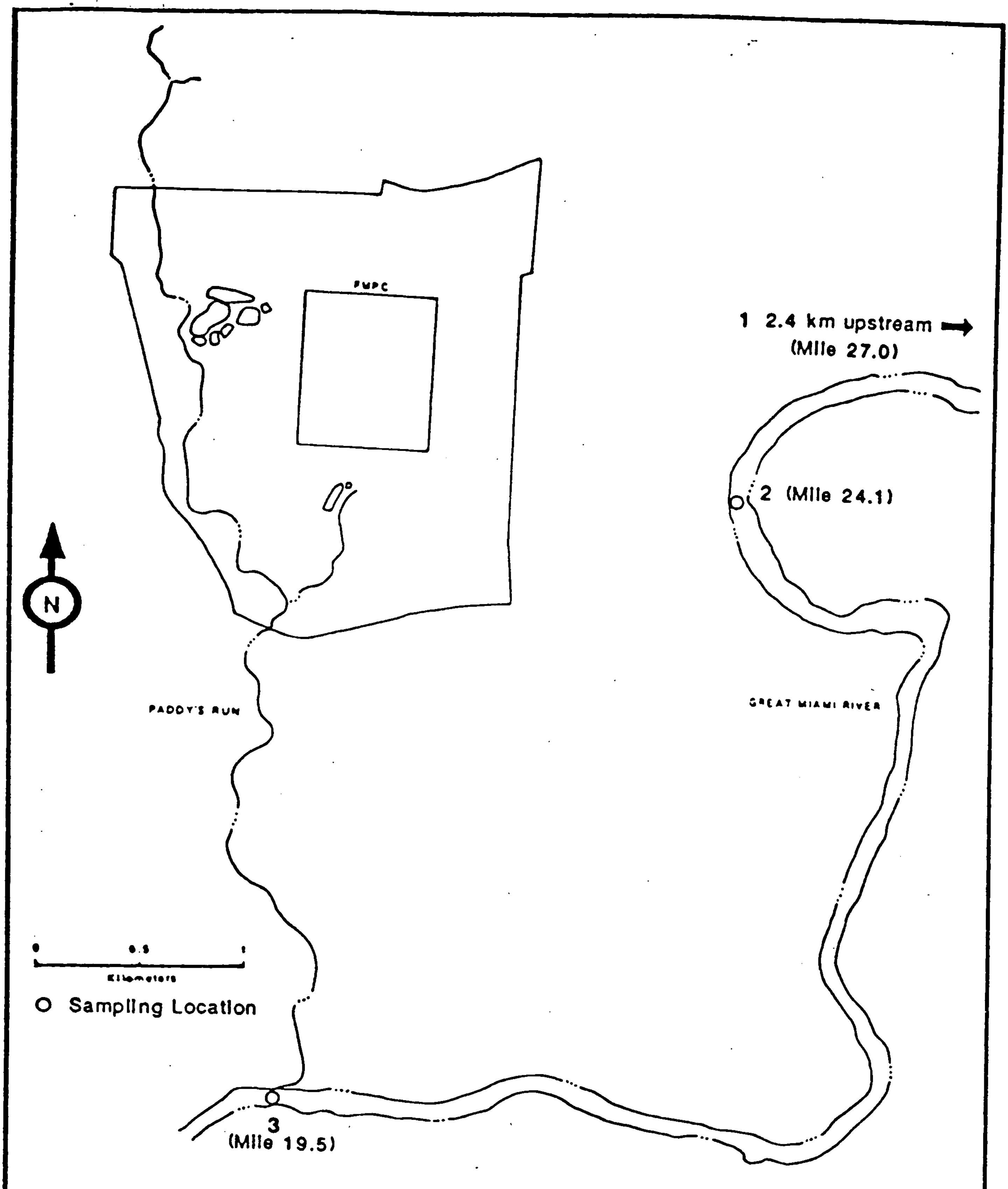
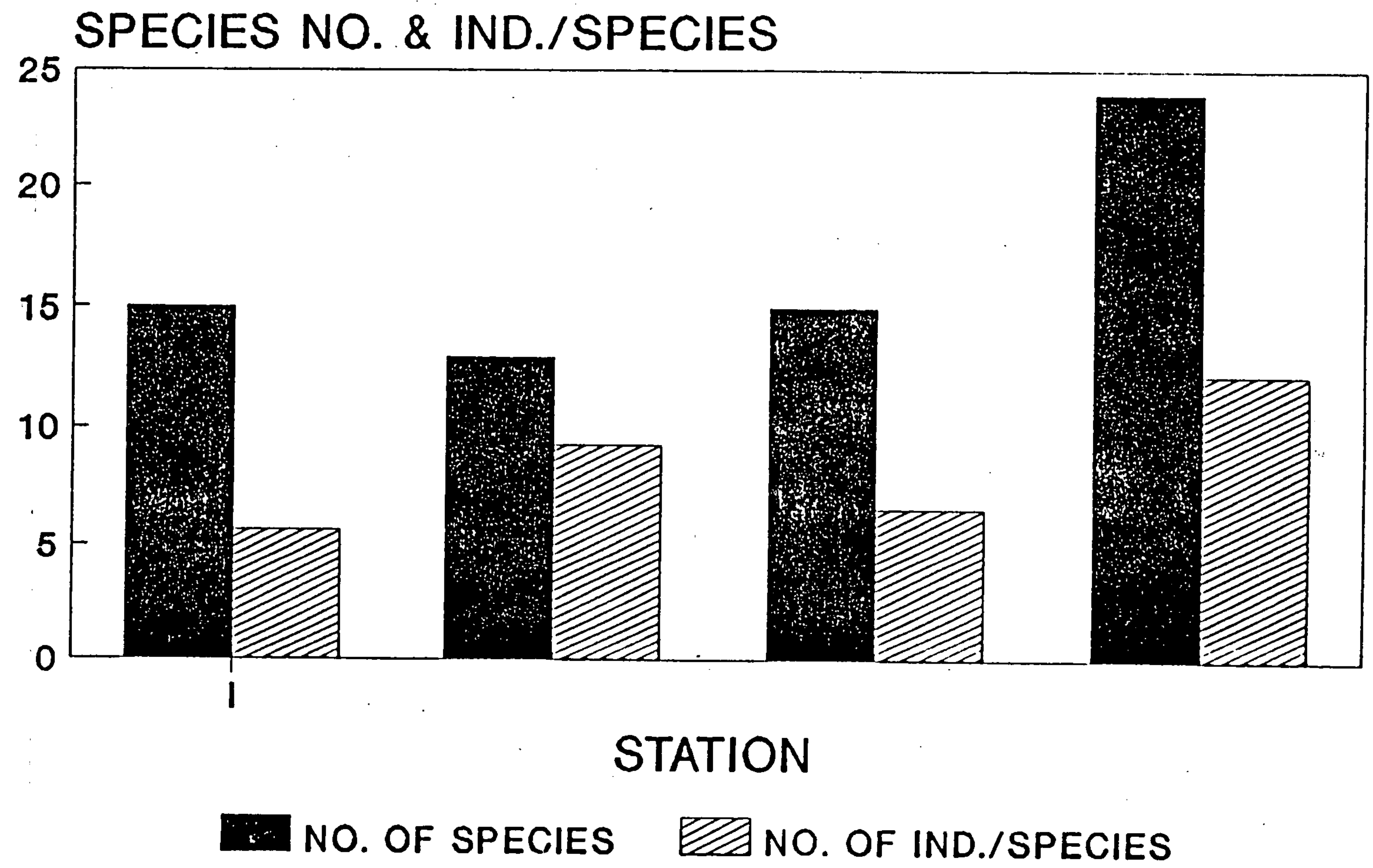


Fish Sampling Locations

DIVERSITY OF FISH BY STATION
GREAT MIAMI RIVER, 1988



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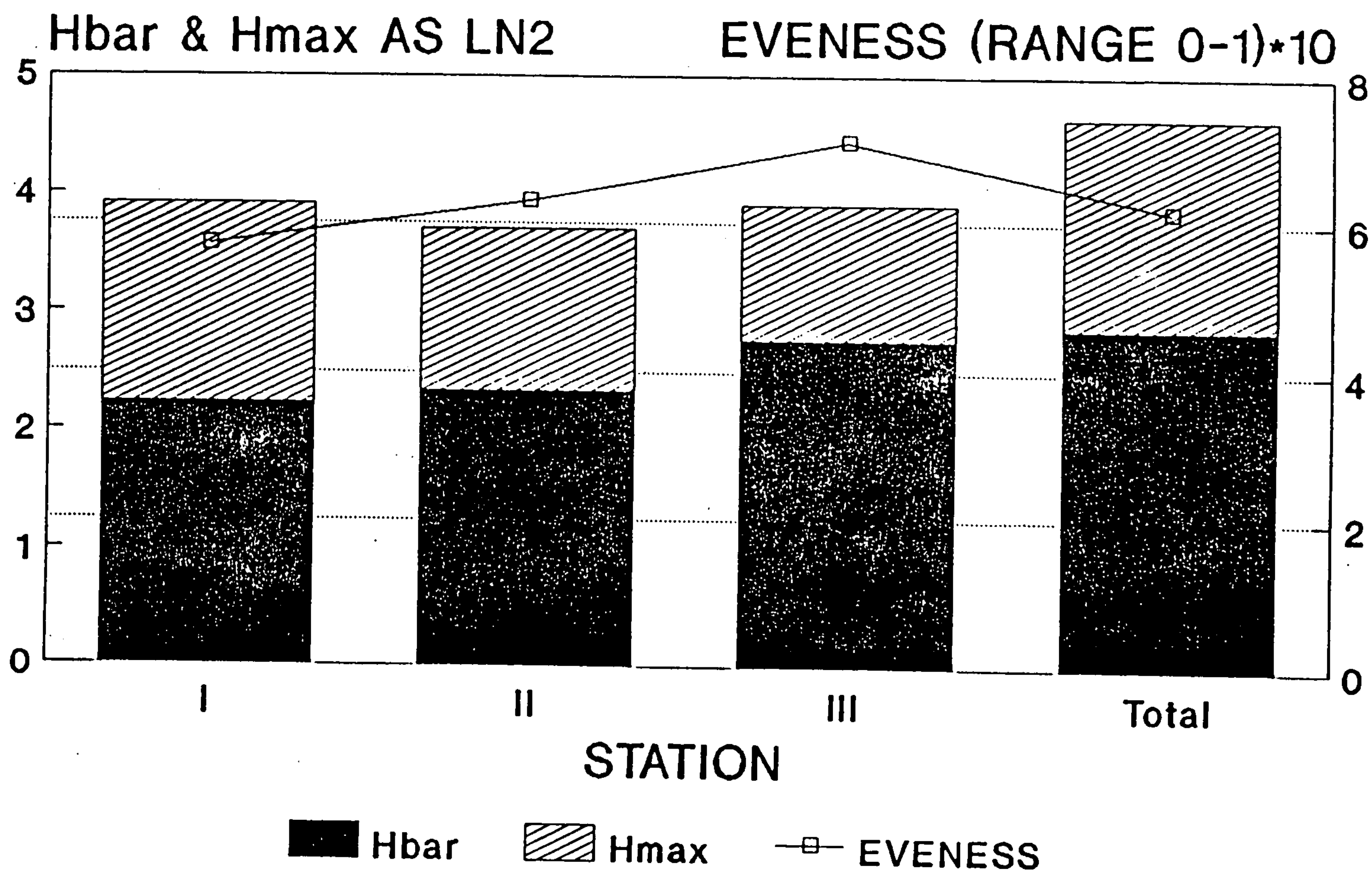
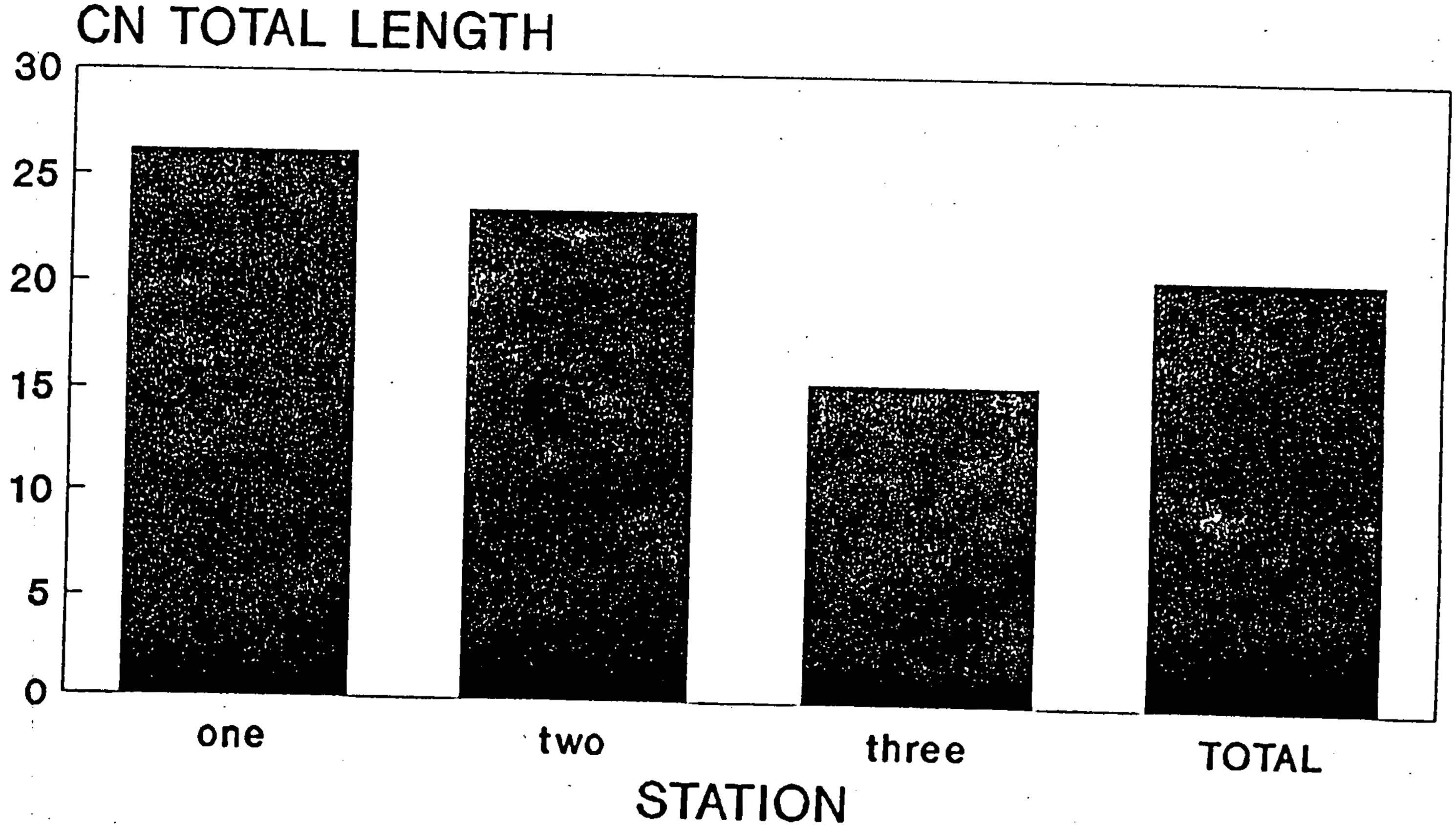
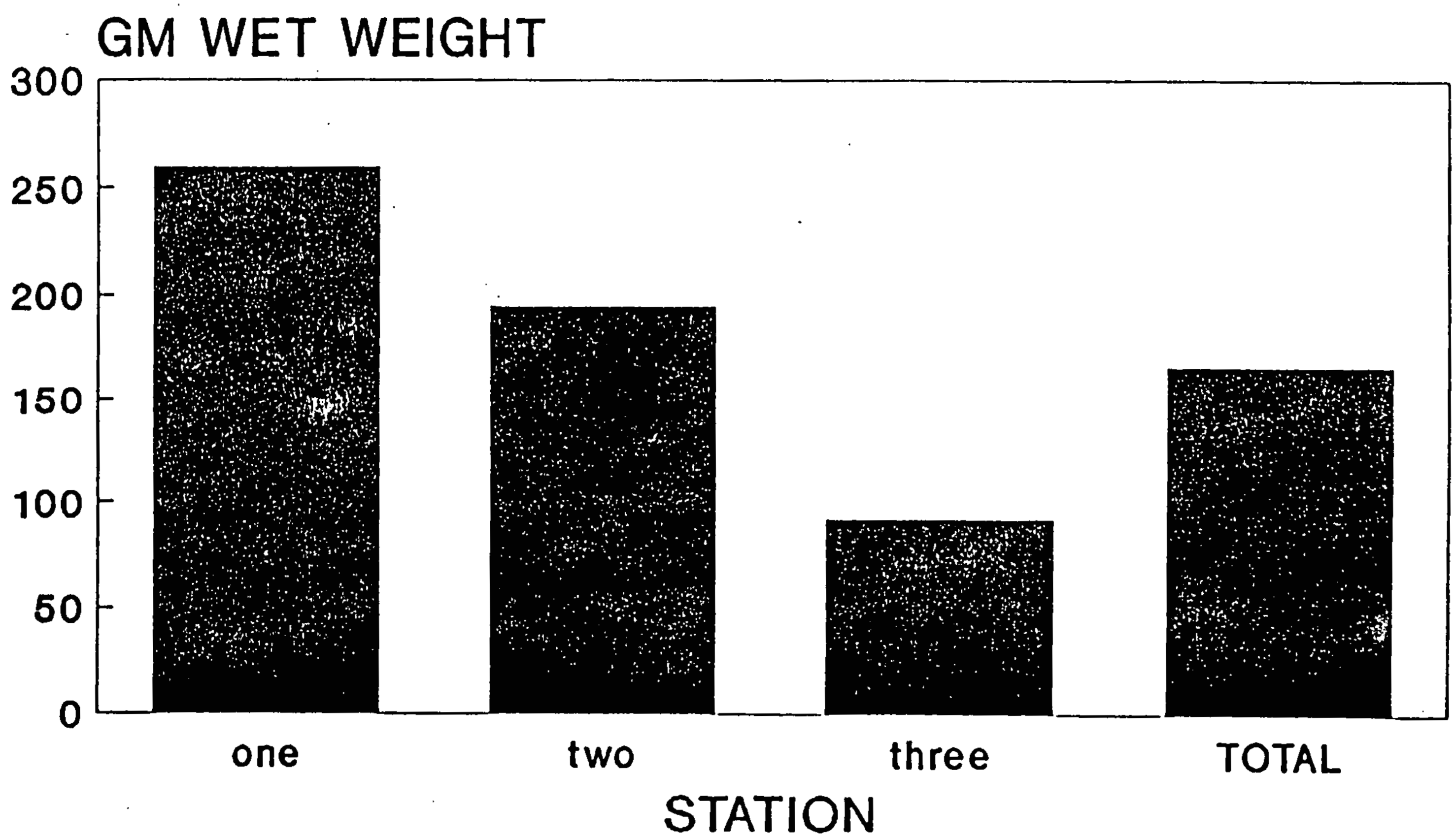
SHANNON-WEAVER DIVERSITY OF FISH GMR
DIVERSITY/INDIVIDUAL & MAX. DIVERSITY



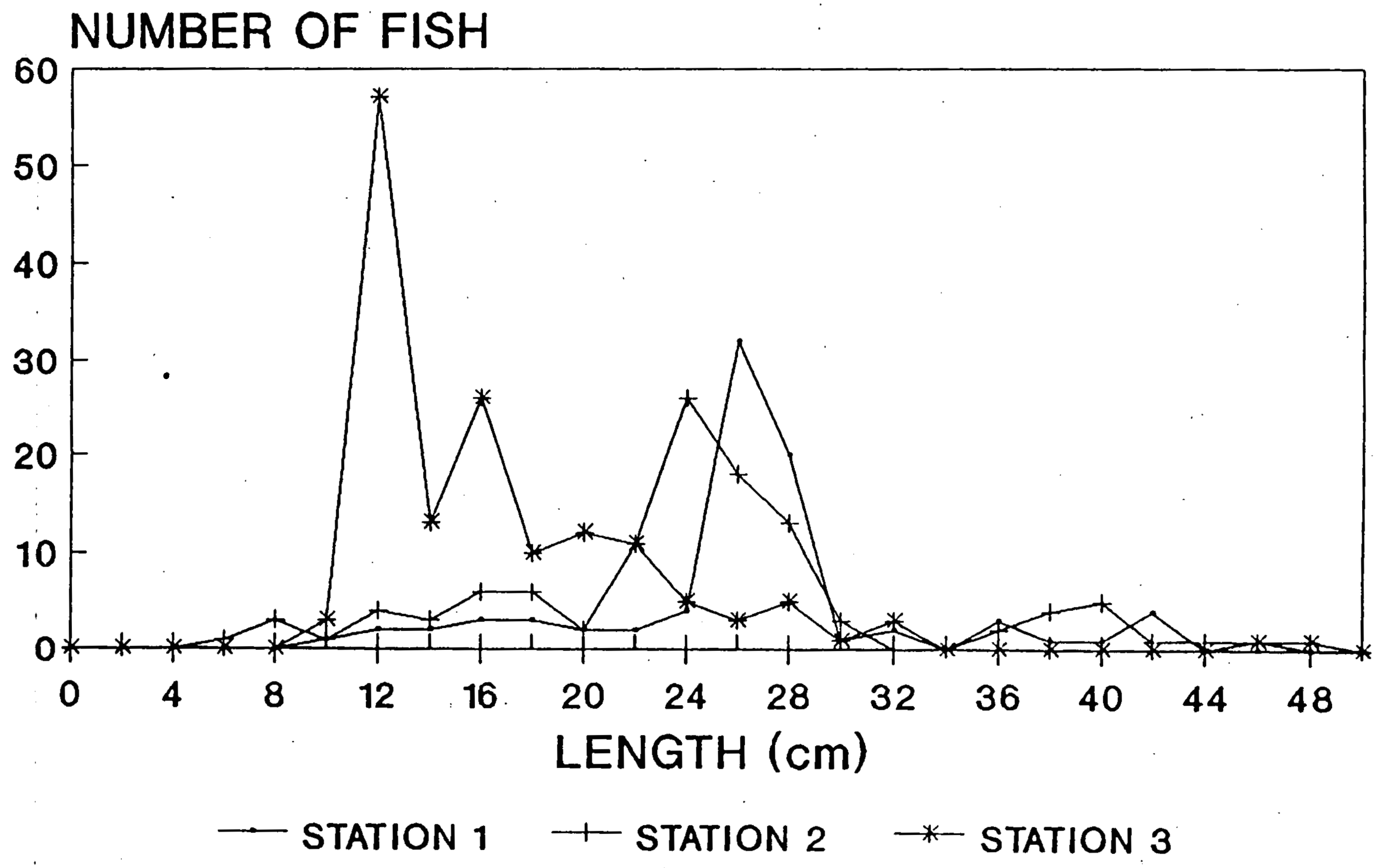
AVERAGE LENGTH OF FISH BY STATION
GREAT MIAMI RIVER, 1988



AVERAGE WEIGHT OF FISH BY STATION
GREAT MIAMI RIVER, 1988



LENGTH FREQUENCY DISTRIBUTION, ALL FISH BY STATION, GREAT MIAMI RIVER 1988



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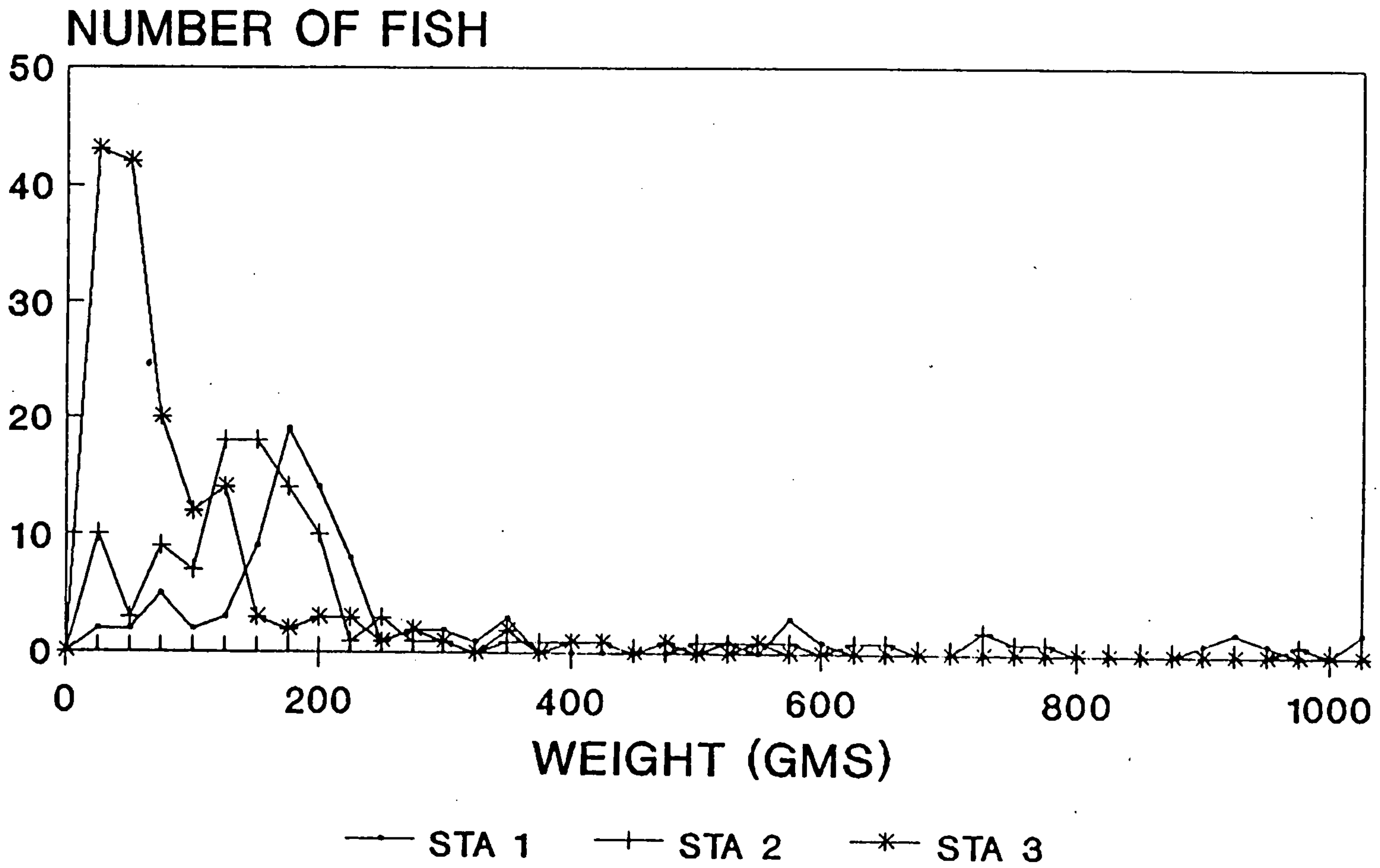
WEIGHT DISTRIBUTION BY STATION, ALL SPP BY STATION, GREAT MIAMI RIVER 1988



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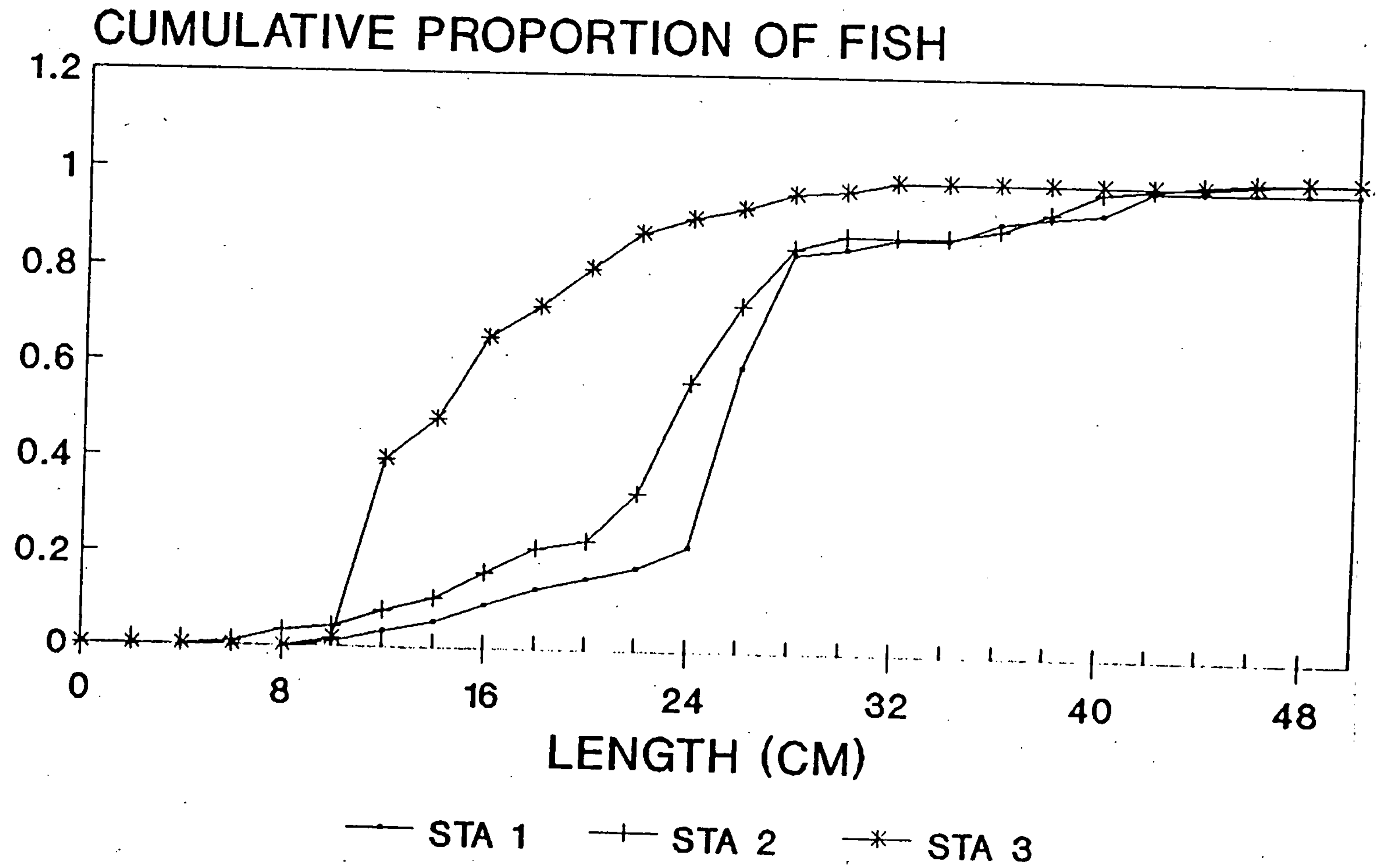
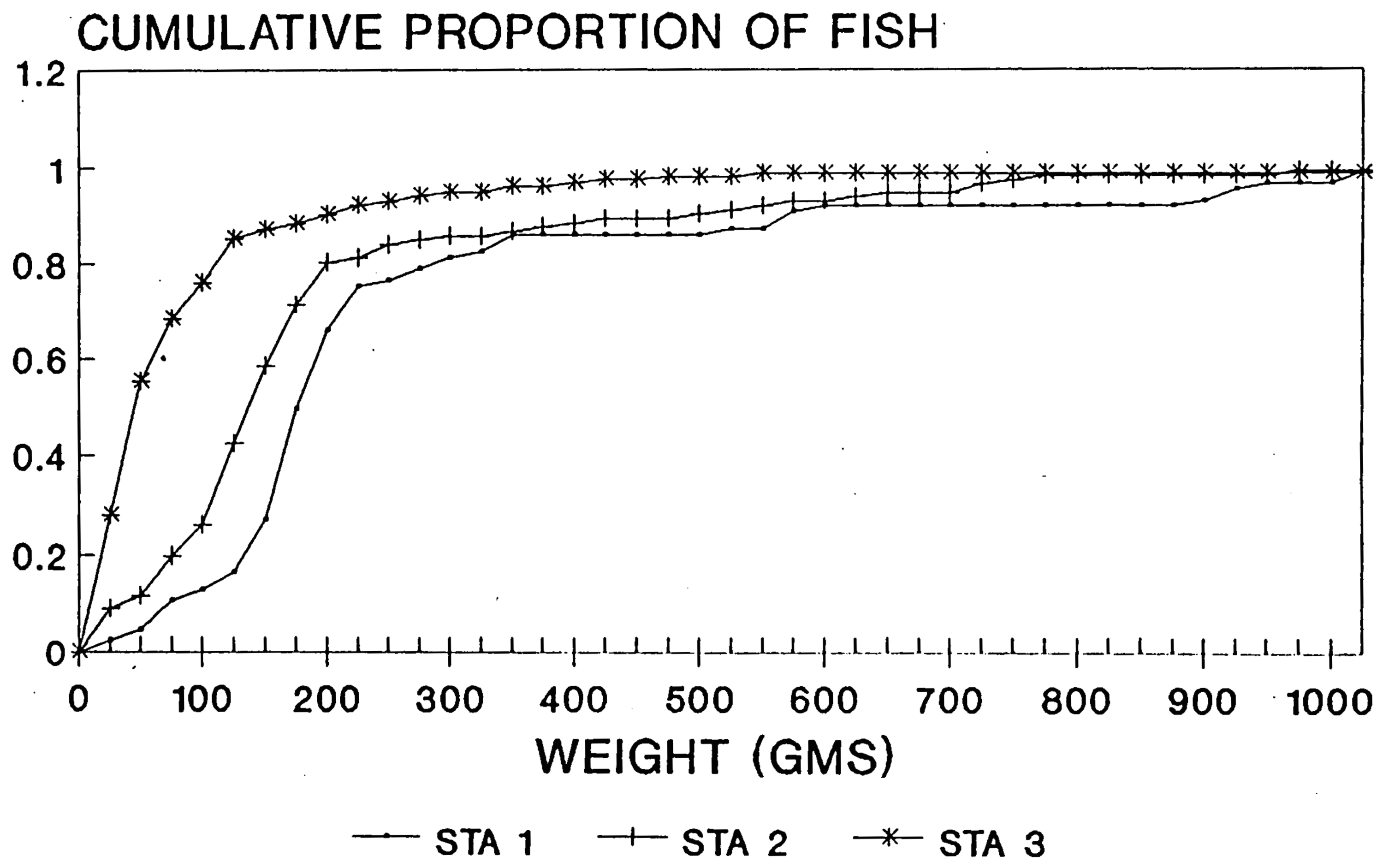
CUMULATIVE LENGTH DISTRIBUTION
ALL FISH, GREAT MIAMI RIVER 1988



CUMULATIVE WEIGHT DISTRIBUTION BY STATION, GREAT MIAMI RIVER



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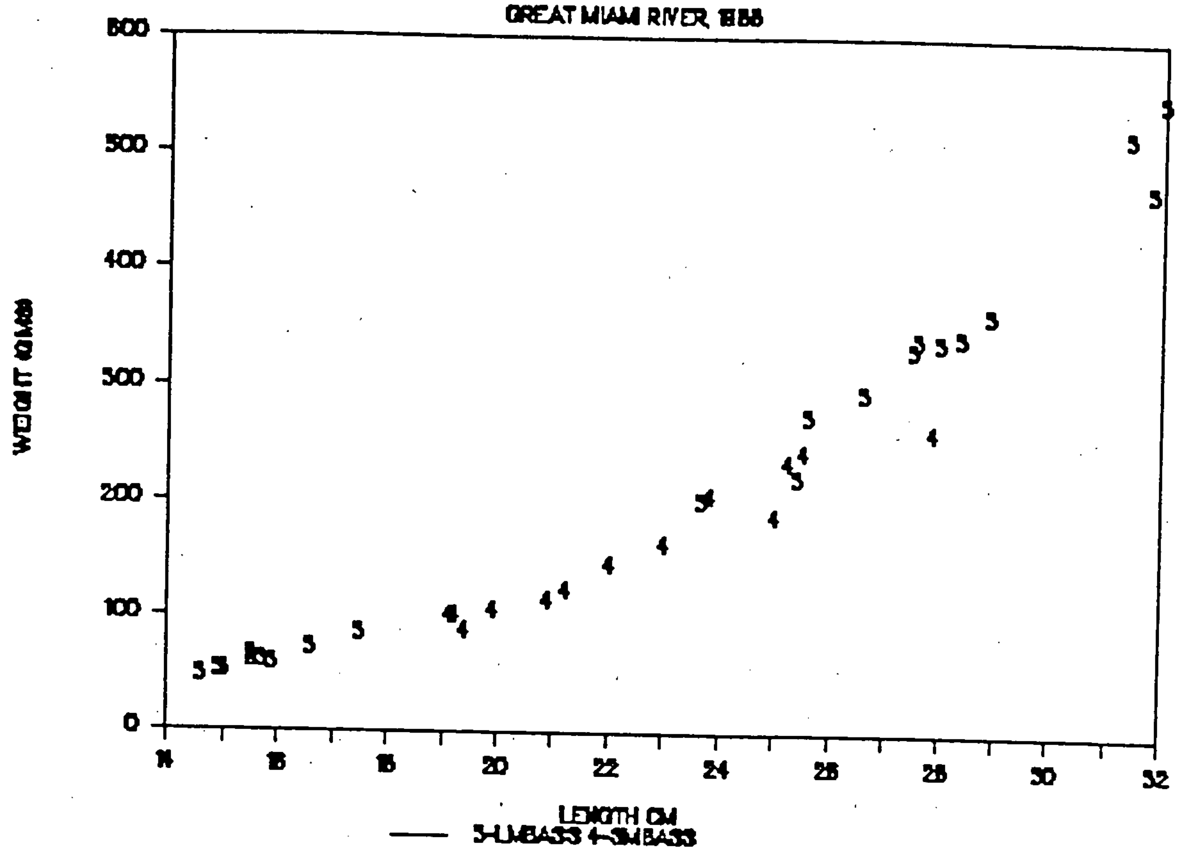
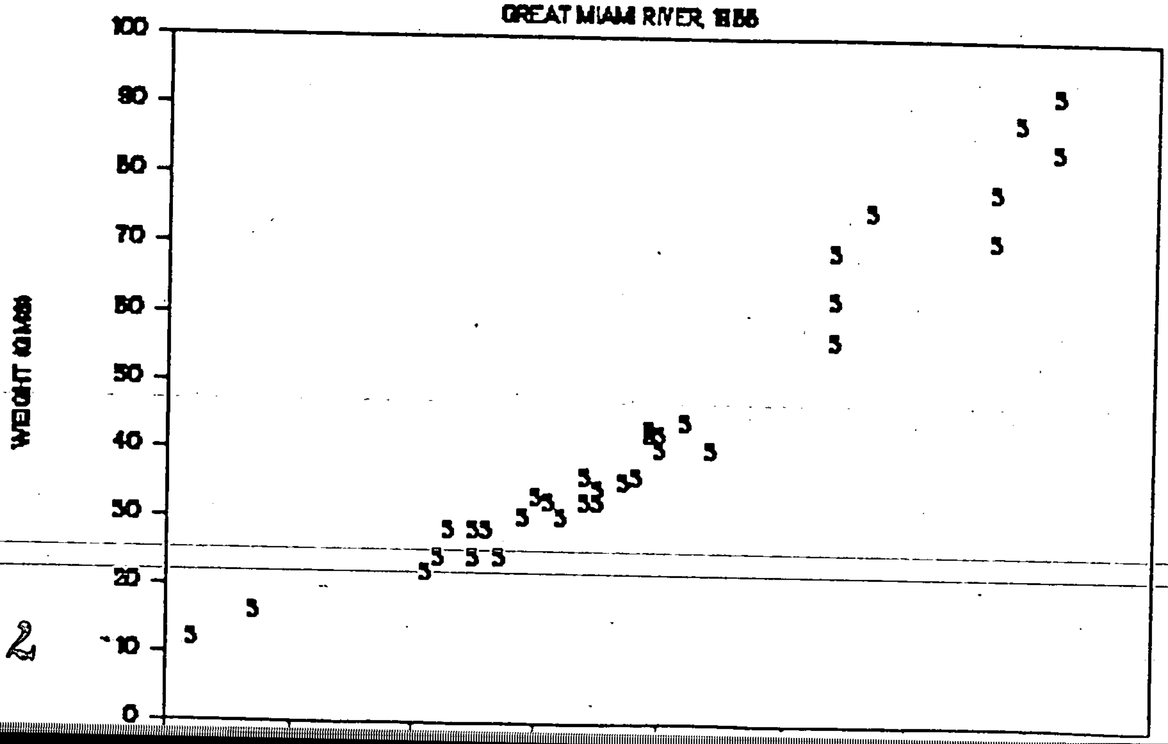
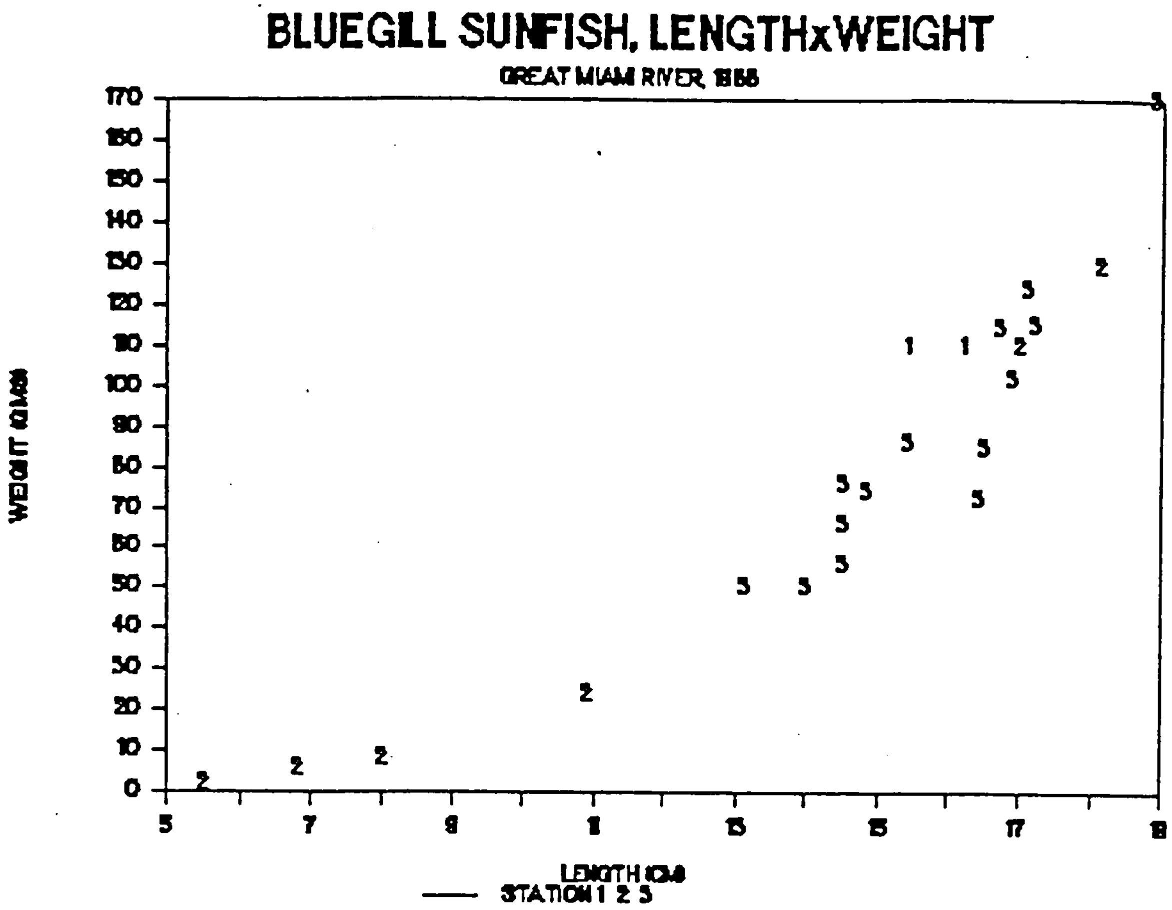

LARGE & SMALL MOUTH BASS, LENGTHxWT.
GREAT MIAMI RIVER, 1988
WEIGHT (GMS)
LENGTH CM
5-LMBASS 4-SMBASS


LONGEAR SUNFISH, LENGTH X WEIGHT
GREAT MIAMI RIVER, 1988
WEIGHT (GMS)


BLUEGILL SUNFISH, LENGTHxWEIGHT
GREAT MIAMI RIVER
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
5
7
9
11
13
15
17
19
LENGTH (CM)
STATION 1 2 3

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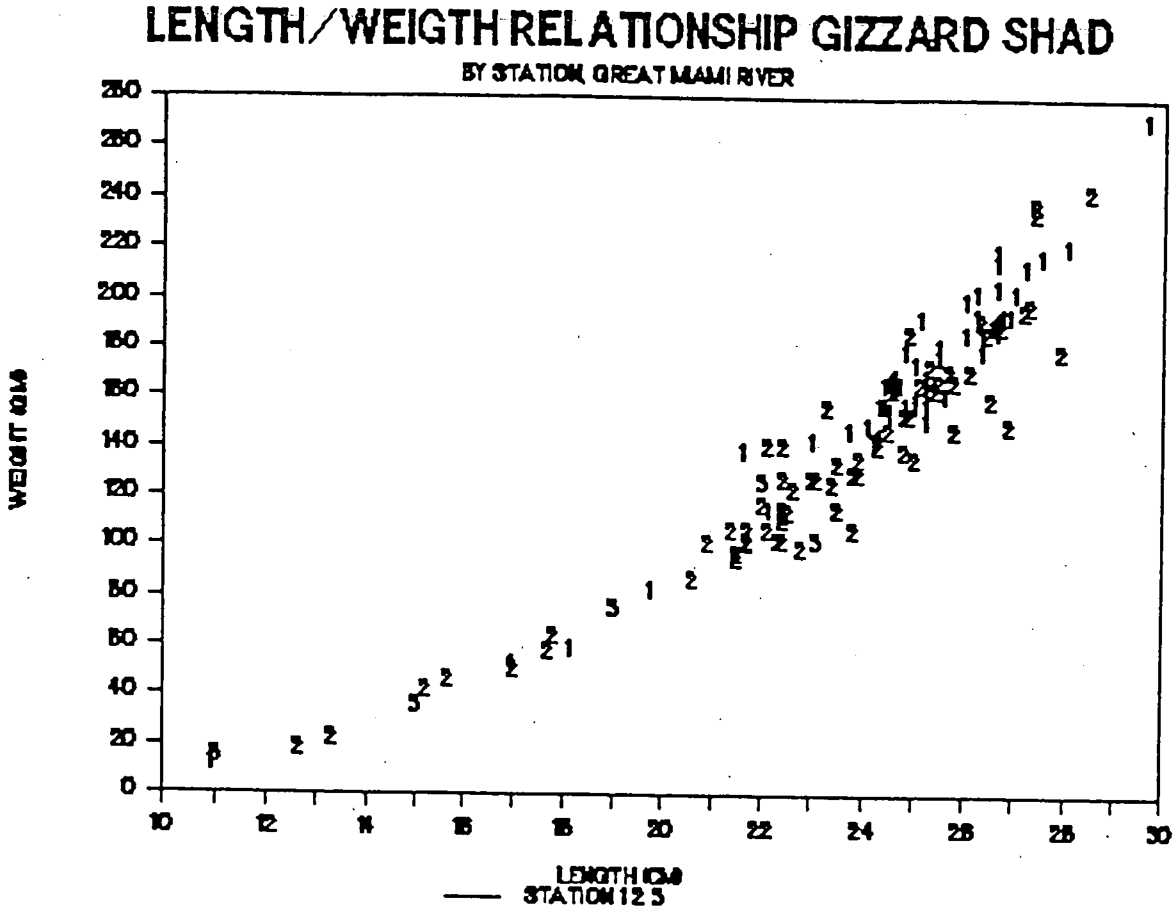
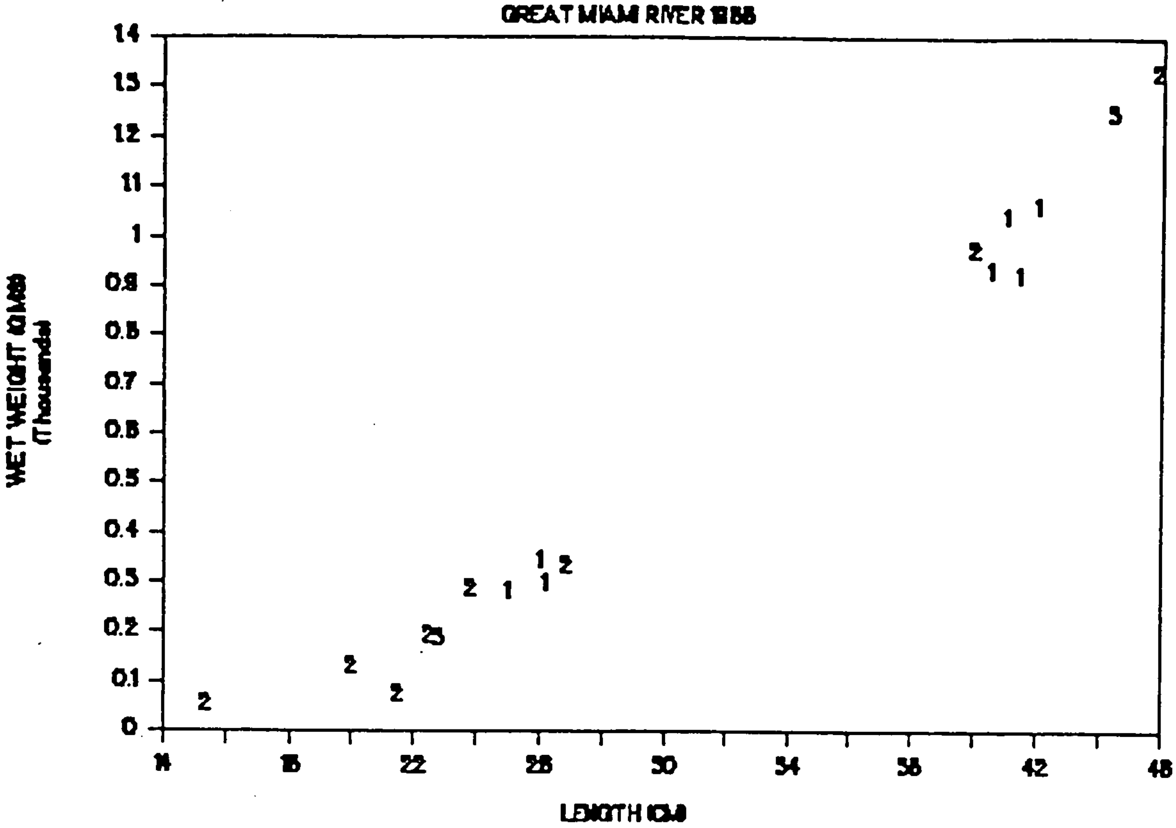


LENGTH/WEIGTH RELATIONSHIP GIZZARD SHAD
BY STATION, GREAT MIAMI RIVER
WEIGHT (GM)
LENGTH (CM)
STATION 1 2 3

0085

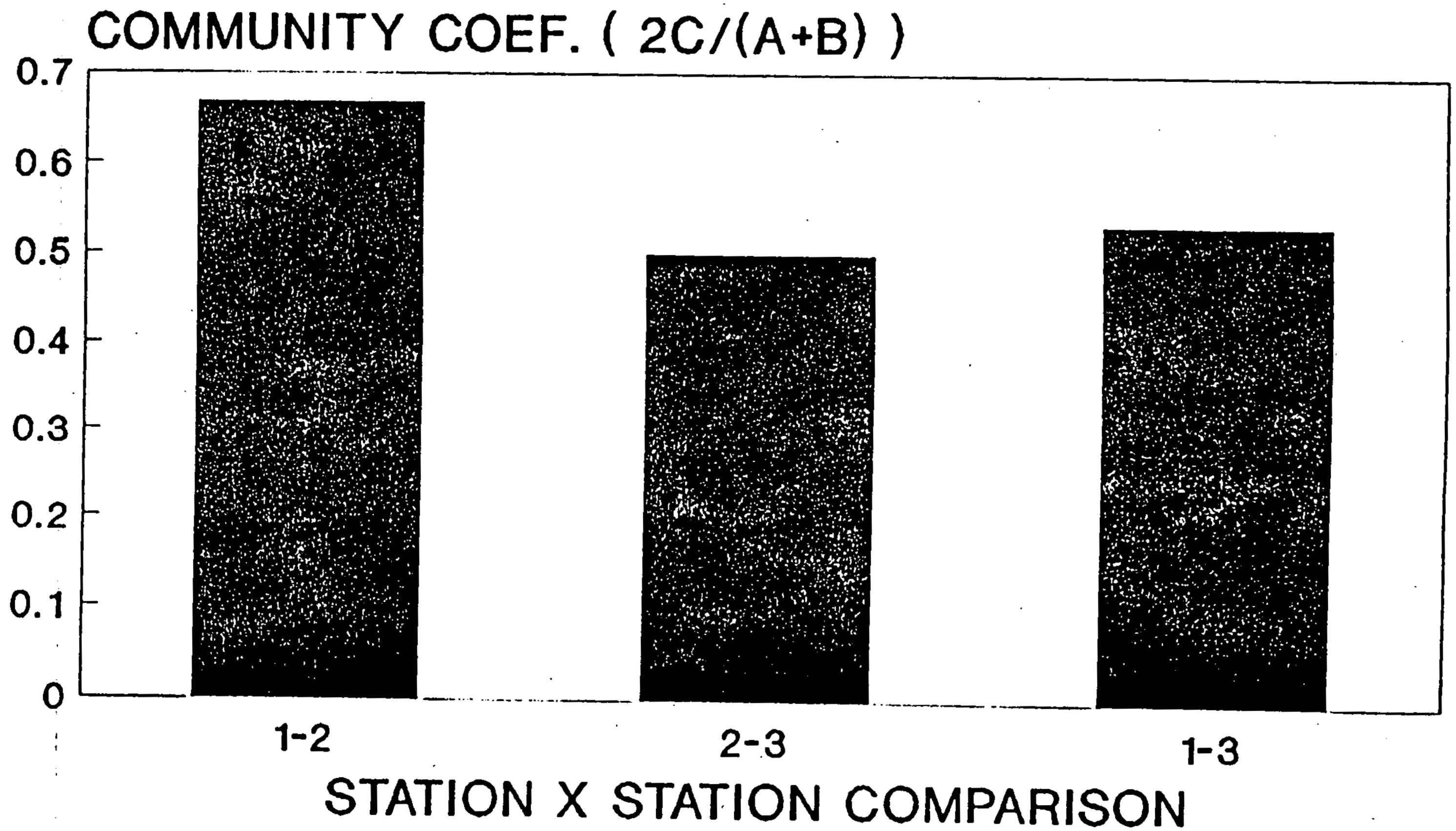
LENGTH X WEIGHT OF CARP

GREAT MIAMI RIVER 1988



000026

COMMUNITY COEFFICIENT BETWEEN STATIONS
GREAT MIAMI RIVER, 1988



LIST OF TABLES

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Table 1: Fish Electroshocked from the Great Miami River on 15-16 Sept. 1985 below Ross(#1),below New Baltimore(#2) and above Miamitown(#3).

	COND. uMHOS/CM	OXYGEN PPM	M TEMP. C	% O2 SAT.	SECCHI (M)	DATE/TIME
SITE 1	865	6.75	22.50	81.9	22	15-SEP. 9:42
SITE 2	645	9.42	23.30	111.5	28	15-SEP. 12:40
SITE 3	710	6.87	19.50	75.7	10	22-SEP. 10:00

000029

Table 2: Family, species and numbers of fish collected by station from Great Miami River survey above and below WMCO, 15. 22 Sept. 1988.

species	family	fam.code	spp.code	STATION	one	two	three	total fish
LONG NOSE GAR	LEPISOSTEIDAE	1	35		1	2		3
CHANNEL CATFISH	ICTALURIDAE	2	15		2	6		8
FLATHEAD CATFISH	ICTALURIDAE	2	22		1	1		2
GIZZARD SHAD	CLUPEIDAE	3	1		54	65	54	173
SKIPJACK HERRING	CLUPEIDAE	3	32				1	1
CYPRINUS CARPIO	CYPRINIDAE	5	2		7	8	2	17
PIMEPAHLES	CYPRINIDAE	5	17			1		1
RIVER CARPSUCKER	CATASTOMIDAE	6	13		1	1		2
REDHORSE	CATASTOMIDAE	6	14			7		7
GOLDEN REDHORSE	CATASTOMIDAE	6	21		1			1
WHITE BASS	PERCICHTHYIDA	7	10		3	3	8	14
LARGE MOUTH BASS	CENTRARCHIDAE	8	3		3	6	12	21
SMALL MOUTH BASS	CENTRARCHIDAE	8	4		1	3	9	13
BLUEGILL SUNFISH	CENTRARCHIDAE	8	5		2	6	14	22
LONGEAR SUNFISH	CENTRARCHIDAE	8	6				40	40
WHITE CRAPPIE	CENTRARCHIDAE	8	7				1	1
GREEN SUNFISH	CENTRARCHIDAE	8	9				4	4
SPOTTED BASS	CENTRARCHIDAE	8	19		3			3
SUNFISH UNIDENT.	CENTRARCHIDAE	8	20		1			1
BLACK CRAPPIE	CENTRARCHIDAE	8	29				2	2
ROCK BASS	CENTRARCHIDAE	8	31		2		2	4
WARMOUTH BASS	CENTRARCHIDAE	8	34				1	1
PUMPKINSEED	CENTRACHIDAE	8	36			2		2
SAUGER	PERCIDAE	9	11				1	1
DRUM	SCIAENIDAE	10	18		3		3	6
total individuals			INIDIVIDUALS/STATI		85	111	154	350 ind
number of species			SPECIES/STATION		15	13	15	25 spp
shock time (hours)			MIN.SHOCKED		35	34	60	129 min
total ind./hr			FISH SHOCKED/HOUR		146	195	154	163 ind
				Hbar/ind	2.2278	2.3337	2.7782	2.8713
				Hmax	3.907	3.700	3.907	4.644
				Eveness	0.570	0.631	0.711	0.618
				station	I	II	III	Total

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Table 3. Weight and length frequency distributions of fish electroshocked from Great Miami River, Sept. 15 & 22, 1988.

WEIGHT FREQUENCY DISTRIBUTIONS					LENGTH FREQUENCY DISTRIBUTIONS				
gm WEIGHT	station 1 weight	station 2 weight	station 3 Weight	TOTALS WT	cm LENGTH	station 1	station2	station	totals
0	0	0	0	0	0	0	0	0	0
25	2	10	43	55	2	0	0	0	0
50	2	3	42	47	4	0	0	0	0
75	5	9	20	34	6	0	1	0	1
100	2	7	12	21	8	0	3	0	3
125	3	18	14	35	10	1	1	3	5
150	9	18	3	30	12	2	4	57	63
175	19	14	2	35	14	2	3	13	18
200	14	10	3	27	16	3	6	26	35
225	8	1	3	12	18	3	6	10	19
250	1	3	1	5	20	2	2	12	16
275	2	1	2	5	22	2	11	11	24
300	2	1	1	4	24	4	26	5	35
325	1	0	0	1	26	32	18	3	53
350	3	1	2	6	28	20	13	5	38
375	0	1	0	1	30	1	3	1	5
400	0	1	1	2	32	2	0	3	5
425	0	1	1	2	34	0	0	0	0
450	0	0	0	0	36	3	2	0	5
475	0	0	1	1	38	1	4	0	5
500	0	1	0	1	40	1	5	0	6
525	1	1	0	2	42	4	1	0	5
550	0	1	1	2	44	0	1	0	1
575	3	1	0	4	46	0	1	1	2
600	1	0	0	1	48	0	0	1	1
625	0	1	0	1	50	0	0	0	0
650	0	1	0	1	>50	2	0	0	2
675	0	0	0	0	SUM	85	111	151	347
700	0	0	0	0					
725	0	2	0	2					
750	0	1	0	1					
775	0	1	0	1					
800	0	0	0	0					
825	0	0	0	0					
850	0	0	0	0					
875	0	0	0	0					
900	1	0	0	1					
925	2	0	0	2					
950	1	0	0	1					
975	0	1	0	1					
1000	0	0	0	0					
1100	2	0	0	2					
	1	1	2	4		85	111	151	347
count	85	111	154	350					
	0								

APPENDIX 1

Table 1: Fish Electroshocked from Great Miami River on 13 & 20 Sept.
below Ross(#1),below New Baltimore(#2)

Code for sex
4 IMMATURE FE
5 GRAVID FEM
3 IMMATURE
1 MALE
2 FEMALE

FISH IN GREAT MIAMI RIVER

15 & 22 SEPT 1988

SPECIES	FAMILY	SITE	SPECIES	WT	LENGTH	SEX
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	32	11.5	3
GIZZARD SHAD	CLUPEIDAE	3	1	102	23.1	1
CYPRINUS CARPIO	CYPRINIDAE	3	2	1248	44.4	2
CYPRINUS CARPIO	CYPRINIDAE	3	2	188	22.8	3
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	548	32.0	
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	470	31.8	
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	342	28.4	2
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	336	28.0	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	292	26.6	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	272	25.6	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	220	25.4	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	200	23.7	1
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	88	19.4	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	60	15.7	2
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	52	15.0	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	52	14.9	1
LARGE MOUTH BASS	CENTRARCHIDAE	3	3	48	14.6	1
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	260	27.9	2
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	232	25.2	2
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	145	22.0	1
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	123	21.2	2
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	113	20.9	2
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	104	19.9	2
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	100	19.2	1
SMALL MOUTH BASS	CENTRARCHIDAE	3	4	100	19.1	3
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	170	18.9	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	124	17.1	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	115	17.2	2
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	114	16.7	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	102	16.9	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	86	15.4	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	85	16.5	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	76	14.5	2
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	74	14.8	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	72	16.4	2
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	66	14.5	2
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	56	14.5	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	50	14.0	1
BLUEGILL SUNFISH	CENTRARCHIDAE	3	5	50	13.1	2
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	92	15.2	1
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	88	14.9	1
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	84	15.2	2
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	78	14.7	1
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	75	13.7	1
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	71	14.7	1
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	69	13.4	2
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	62	13.4	1
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	56	13.4	2
LONGEAR SUNFISH	CENTRARCHIDAE	3	6	44	12.2	2

	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	44	12.2	2
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	43	11.9	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	42	11.9	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	42	12.0	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	40	12.4	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	40	12.0	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	36	11.4	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	36	11.8	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	35	11.7	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	34	11.5	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	33	11.0	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	32	11.4	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	32	11.1	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	32	11.5	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	30	11.2	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	30	10.9	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	28	10.3	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	28	10.5	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	28	10.3	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	28	10.6	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	24	10.7	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	24	10.5	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	24	10.2	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	22	10.1	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	16	8.7	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	12	8.2	3
	BLACK CRAPPIE	CENTRARCHIDAE	3	29	204	23.2	1
	WHITE CRAPPIE	CENTRARCHIDAE	3	7	135	21.0	2
	GREEN SUNFISH	CENTRARCHIDAE	3	9	72	14.6	3
	GREEN SUNFISH	CENTRARCHIDAE	3	9	50	13.5	3
	GREEN SUNFISH	CENTRARCHIDAE	3	9	48	13.1	3
	GREEN SUNFISH	CENTRARCHIDAE	3	9	20	10.0	3
	WHITE BASS	PERCICHTHYIDAE	3	10	380	27.5	2
	WHITE BASS	PERCICHTHYIDAE	3	10	84	18.3	2
	WHITE BASS	PERCICHTHYIDAE	3	10	76	17.5	2
	WHITE BASS	PERCICHTHYIDAE	3	10	72	17.9	1
	WHITE BASS	PERCICHTHYIDAE	3	10	45	15.3	1
	WHITE BASS	PERCICHTHYIDAE	3	10	36	15.2	3
	WHITE BASS	PERCICHTHYIDAE	3	10	26	13.0	3
	WHITE BASS	PERCICHTHYIDAE	3	10	20	12.0	3
	SAUGER	PERCIDAE	3	11	166	27.0	1
	DRUM	SCIAENIDAE	3	18	1296	46.6	2
	DRUM	SCIAENIDAE	3	18	407	31.4	NA
	DRUM	SCIAENIDAE	3	18	28	13.7	3
	BLACK CRAPPIE	CENTRARCHIDAE	3	29	204	22.2	2
	ROCK BASS	CENTRARCHIDAE	3	31	181	20.5	1
	ROCK BASS	CENTRARCHIDAE	3	31	32	11.6	2
avg.cm	SKIPJACK HERRING	CLUPEIDAE	3	32	35	16.7	3
17.0	WARMOUTH BASS	CENTRARCHIDAE	3	34	136	17.7	3
	CYPRINUS CARPIO	CYPRINIDAE	1	2	1060	42.0	1
	CYPRINUS CARPIO	CYPRINIDAE	1	2	340	26.0	3
	CYPRINUS CARPIO	CYPRINIDAE	1	2	1040	41.0	5
	ROCK BASS	CENTRARCHIDAE	1	31	324	27.3	3
	CYPRINUS CARPIO	CYPRINIDAE	1	2	929	40.5	5
	CYPRINUS CARPIO	CYPRINIDAE	1	2	922	41.4	5
	CYPRINUS CARPIO	CYPRINIDAE	1	2	280	25.0	1
	CHANNEL CATFISH	ICTALURIDAE	1	15	564	40.0	1
	CHANNEL CATFISH	ICTALURIDAE	1	15	268	32.0	4
	CYPRINUS CARPIO	CYPRINIDAE	1	2	296	26.2	1
	DRUM	SCIAENIDAE	1	18	560	35.0	1

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	GIZZARD SHAD	CLUPEIDAE	1	1	192	26.7	3
	GIZZARD SHAD	CLUPEIDAE	1	1	156	25.2	3
	GIZZARD SHAD	CLUPEIDAE	1	1	160	25.6	3
	GIZZARD SHAD	CLUPEIDAE	1	1	192	26.9	3
	GIZZARD SHAD	CLUPEIDAE	1	1	190	26.6	3
	LONGNOSE GAR	LEPISOSTEIDAE	1	35	884	75.0	0
	FLATHEAD CATFISH	ICTALURIDAE	1	22	1302	50.1	0
	GIZZARD SHAD	CLUPEIDAE	1	1	82	19.7	3
	GIZZARD SHAD	CLUPEIDAE	1	1	184	26.3	3
	GIZZARD SHAD	CLUPEIDAE	1	1	170	25.7	3
	GIZZARD SHAD	CLUPEIDAE	1	1	158	25.0	3
	GIZZARD SHAD	CLUPEIDAE	1	1	52	16.9	3
avg.cm	GIZZARD SHAD	CLUPEIDAE	1	1	12	10.9	3
26.2	ROCK BASS	CENTRARCHIDAE	1	31	38	12.2	3
	GIZZARD SHAD	CLUPEIDAE	2	1	140	22.1	3
	GIZZARD SHAD	CLUPEIDAE	2	1	102	22.3	3
	GIZZARD SHAD	CLUPEIDAE	2	1	132	23.5	3
	GIZZARD SHAD	CLUPEIDAE	2	1	100	20.9	3
	GIZZARD SHAD	CLUPEIDAE	2	1	126	22.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	114	22.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	122	22.6	3
	GIZZARD SHAD	CLUPEIDAE	2	1	100	21.7	3
	GIZZARD SHAD	CLUPEIDAE	2	1	164	25.1	3
	GIZZARD SHAD	CLUPEIDAE	2	1	190	26.3	3
	GIZZARD SHAD	CLUPEIDAE	2	1	106	21.7	3
	GIZZARD SHAD	CLUPEIDAE	2	1	106	22.1	3
	GIZZARD SHAD	CLUPEIDAE	2	1	166	25.5	3
	GIZZARD SHAD	CLUPEIDAE	2	1	126	23.1	3
	GIZZARD SHAD	CLUPEIDAE	2	1	166	25.8	3
	GIZZARD SHAD	CLUPEIDAE	2	1	170	26.1	3
	GIZZARD SHAD	CLUPEIDAE	2	1	42	15.2	3
	GIZZARD SHAD	CLUPEIDAE	2	1	106	23.8	3
	GIZZARD SHAD	CLUPEIDAE	2	1	242	28.5	2
	GIZZARD SHAD	CLUPEIDAE	2	1	196	27.3	3
	GIZZARD SHAD	CLUPEIDAE	2	1	185	24.9	3
	GIZZARD SHAD	CLUPEIDAE	2	1	110	22.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	124	23.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	237	27.4	2
	GIZZARD SHAD	CLUPEIDAE	2	1	116	22.0	3
	GIZZARD SHAD	CLUPEIDAE	2	1	140	22.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	155	23.3	3
	GIZZARD SHAD	CLUPEIDAE	2	1	146	25.8	3
	GIZZARD SHAD	CLUPEIDAE	2	1	98	22.8	3
	GIZZARD SHAD	CLUPEIDAE	2	1	188	26.7	3
	GIZZARD SHAD	CLUPEIDAE	2	1	170	25.7	3
	GIZZARD SHAD	CLUPEIDAE	2	1	140	24.3	3
	GIZZARD SHAD	CLUPEIDAE	2	1	158	26.5	3
	GIZZARD SHAD	CLUPEIDAE	2	1	146	15.7	3
	GIZZARD SHAD	CLUPEIDAE	2	1	194	27.2	2
	GIZZARD SHAD	CLUPEIDAE	2	1	113	22.5	3
	GIZZARD SHAD	CLUPEIDAE	2	1	134	23.9	3
	GIZZARD SHAD	CLUPEIDAE	2	1	86	20.6	3
	GIZZARD SHAD	CLUPEIDAE	2	1	162	24.6	3
	GIZZARD SHAD	CLUPEIDAE	2	1	234	27.4	2
	GIZZARD SHAD	CLUPEIDAE	2	1	126	23.0	3
	GIZZARD SHAD	CLUPEIDAE	2	1	96	21.5	3
	GIZZARD SHAD	CLUPEIDAE	2	1	102	22.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	128	23.8	3
	GIZZARD SHAD	CLUPEIDAE	2	1	112	22.4	3
	GIZZARD SHAD	CLUPEIDAE	2	1	172	25.3	3

DRUM	SCIAENIDAE	1	18	911	37.9	2
RIVER CARPSUCKER	CATASTOMIDAE	1	13	582	35.0	2
GOLDEN REDHORSE	CATASTOMIDAE	1	21	552	35.7	1
DRUM	SCIAENIDAE	1	18	138	21.8	3
LARGE MOUTH BASS	CENTRARCHIDAE	1	3	331	27.5	1
LARGE MOUTH BASS	CENTRARCHIDAE	1	3	517	31.4	1
LARGE MOUTH BASS	CENTRARCHIDAE	1	3	340	27.6	2
SMALL MOUTH BASS	CENTRARCHIDAE	1	4	242	25.5	1
WHITE BASS	PERCICHTHYIDAE	1	10	144	22.5	1
WHITE BASS	PERCICHTHYIDAE	1	10	82	17.5	3
WHITE BASS	PERCICHTHYIDAE	1	10	58	16.0	3
SPOTTED BASS	CENTRARCHIDAE	1	19	74	14.3	1
BLUEGILL SUNFISH	CENTRARCHIDAE	1	5	110	15.4	1
BLUEGILL SUNFISH	CENTRARCHIDAE	1	5	110	16.2	4
SPOTTED BASS	CENTRARCHIDAE	1	19	52	12.5	2
SUNFISH UNIDENT.	CENTRARCHIDAE	1	20	40	12.0	3
SPOTTED BASS	CENTRARCHIDAE	1	19	20	9.6	3
GIZZARD SHAD	CLUPEIDAE	1	1	198	26.0	2
GIZZARD SHAD	CLUPEIDAE	1	1	178	26.3	2
GIZZARD SHAD	CLUPEIDAE	1	1	202	26.2	1
GIZZARD SHAD	CLUPEIDAE	1	1	188	26.5	2
GIZZARD SHAD	CLUPEIDAE	1	1	185	26.0	3
GIZZARD SHAD	CLUPEIDAE	1	1	164	24.7	3
GIZZARD SHAD	CLUPEIDAE	1	1	220	28.0	2
GIZZARD SHAD	CLUPEIDAE	1	1	216	27.5	3
GIZZARD SHAD	CLUPEIDAE	1	1	186	26.6	4
GIZZARD SHAD	CLUPEIDAE	1	1	173	25.0	4
GIZZARD SHAD	CLUPEIDAE	1	1	142	24.2	4
GIZZARD SHAD	CLUPEIDAE	1	1	271	29.6	1
GIZZARD SHAD	CLUPEIDAE	1	1	156	25.0	4
GIZZARD SHAD	CLUPEIDAE	1	1	156	24.8	3
GIZZARD SHAD	CLUPEIDAE	1	1	204	26.6	1
GIZZARD SHAD	CLUPEIDAE	1	1	202	27.0	4
GIZZARD SHAD	CLUPEIDAE	1	1	163	24.6	3
GIZZARD SHAD	CLUPEIDAE	1	1	146	23.7	3
GIZZARD SHAD	CLUPEIDAE	1	1	156	24.4	3
GIZZARD SHAD	CLUPEIDAE	1	1	212	27.2	1
GIZZARD SHAD	CLUPEIDAE	1	1	152	24.5	3
GIZZARD SHAD	CLUPEIDAE	1	1	156	24.3	3
GIZZARD SHAD	CLUPEIDAE	1	1	142	23.0	3
GIZZARD SHAD	CLUPEIDAE	1	1	162	24.6	3
GIZZARD SHAD	CLUPEIDAE	1	1	58	18.1	3
GIZZARD SHAD	CLUPEIDAE	1	1	160	25.2	3
GIZZARD SHAD	CLUPEIDAE	1	1	180	25.5	3
GIZZARD SHAD	CLUPEIDAE	1	1	178	24.8	3
GIZZARD SHAD	CLUPEIDAE	1	1	114	22.1	3
GIZZARD SHAD	CLUPEIDAE	1	1	164	24.4	3
GIZZARD SHAD	CLUPEIDAE	1	1	218	26.6	2
GIZZARD SHAD	CLUPEIDAE	1	1	214	26.6	4
GIZZARD SHAD	CLUPEIDAE	1	1	191	25.1	3
GIZZARD SHAD	CLUPEIDAE	1	1	168	24.6	3
GIZZARD SHAD	CLUPEIDAE	1	1	154	24.5	3
GIZZARD SHAD	CLUPEIDAE	1	1	166	24.5	3
GIZZARD SHAD	CLUPEIDAE	1	1	138	21.6	3
GIZZARD SHAD	CLUPEIDAE	1	1	148	24.1	3
GIZZARD SHAD	CLUPEIDAE	1	1	192	26.2	3
GIZZARD SHAD	CLUPEIDAE	1	1	168	25.2	3
GIZZARD SHAD	CLUPEIDAE	1	1	144	24.3	3
GIZZARD SHAD	CLUPEIDAE	1	1	150	25.2	3
GIZZARD SHAD	CLUPEIDAE	1	1	176	25.5	3

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	CYPRINUS CARPIO	CYPRINIDAE	2	2	330	26.8	3
	CYPRINUS CARPIO	CYPRINIDAE	2	2	288	23.8	3
	CYPRINUS CARPIO	CYPRINIDAE	2	2	74	21.5	3
avg cm	CYPRINUS CARPIO	CYPRINIDAE	2	2	128	20.0	3
23.5	CYPRINUS CARPIO	CYPRINIDAE	2	2	190	22.5	3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	6		3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	7		3
	LONGEAR SUNFISH	CENTRARCHIDAE	3	6	5		3
	GIZZARD SHAD	CLUPEIDAE	3	1	125	22	3
	GIZZARD SHAD	CLUPEIDAE	3	1	125	22	3
	GIZZARD SHAD	CLUPEIDAE	3	1	125	22	3
	GIZZARD SHAD	CLUPEIDAE	3	1	125	22	3
	GIZZARD SHAD	CLUPEIDAE	3	1	125	22	3
	GIZZARD SHAD	CLUPEIDAE	3	1	125	22	3
	GIZZARD SHAD	CLUPEIDAE	3	1	75	19	3
	GIZZARD SHAD	CLUPEIDAE	3	1	75	19	3
	GIZZARD SHAD	CLUPEIDAE	3	1	75	19	3
	GIZZARD SHAD	CLUPEIDAE	3	1	75	19	3
	GIZZARD SHAD	CLUPEIDAE	3	1	75	19	3
	GIZZARD SHAD	CLUPEIDAE	3	1	75	19	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	35	15	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3
	GIZZARD SHAD	CLUPEIDAE	3	1	15	11	3

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GIZZARD SHAD	CLUPEIDAE	2	1	63	17.8	3
GIZZARD SHAD	CLUPEIDAE	2	1	152	24.8	3
GIZZARD SHAD	CLUPEIDAE	2	1	148	26.9	3
GIZZARD SHAD	CLUPEIDAE	2	1	22	13.3	3
GIZZARD SHAD	CLUPEIDAE	2	1	162	25.4	3
GIZZARD SHAD	CLUPEIDAE	2	1	185	26.4	3
GIZZARD SHAD	CLUPEIDAE	2	1	152	24.9	3
GIZZARD SHAD	CLUPEIDAE	2	1	106	21.4	3
GIZZARD SHAD	CLUPEIDAE	2	1	57	17.7	3
GIZZARD SHAD	CLUPEIDAE	2	1	134	25.0	3
GIZZARD SHAD	CLUPEIDAE	2	1	178	27.9	3
GIZZARD SHAD	CLUPEIDAE	2	1	102	21.7	3
GIZZARD SHAD	CLUPEIDAE	2	1	94	21.5	3
GIZZARD SHAD	CLUPEIDAE	2	1	128	23.9	3
GIZZARD SHAD	CLUPEIDAE	2	1	138	24.8	3
GIZZARD SHAD	CLUPEIDAE	2	1	50	17.0	3
GIZZARD SHAD	CLUPEIDAE	2	1	114	23.5	3
GIZZARD SHAD	CLUPEIDAE	2	1	146	24.5	3
GIZZARD SHAD	CLUPEIDAE	2	1	18	12.6	3
WHITE BASS	PERCICHTHYIDAE	2	10	158	24.2	2
WHITE BASS	PERCICHTHYIDAE	2	10	113	20.5	3
WHITE BASS	PERCICHTHYIDAE	2	10	252	27.0	1
PUMPKINSEED	CENTRARCHIDAE	2	36	42	12.0	3
PUMPKINSEED	CENTRARCHIDAE	2	36	56	12.5	3
BLUEGILL SUNFISH	CENTRARCHIDAE	2	5	129	18.1	2
LARGE MOUTH BASS	CENTRARCHIDAE	2	3	60	15.5	3
LARGE MOUTH BASS	CENTRARCHIDAE	2	3	58	15.9	3
LARGE MOUTH BASS	CENTRARCHIDAE	2	3	64	15.5	3
LARGE MOUTH BASS	CENTRARCHIDAE	2	3	84	17.5	3
LARGE MOUTH BASS	CENTRARCHIDAE	2	3	361	28.9	2
SMALL MOUTH BASS	CENTRARCHIDAE	2	4	186	25.0	2
LARGE MOUTH BASS	CENTRARCHIDAE	2	3	72	16.6	3
SMALL MOUTH BASS	CENTRARCHIDAE	2	4	204	23.8	1
SMALL MOUTH BASS	CENTRARCHIDAE	2	4	162	23.0	2
CHANNEL CATFISH	ICTALURIDAE	2	15	404	35.8	1
CHANNEL CATFISH	ICTALURIDAE	2	15	492	38.8	1
CHANNEL CATFISH	ICTALURIDAE	2	15	722	43.5	1
CHANNEL CATFISH	ICTALURIDAE	2	15	501	37.2	2
CHANNEL CATFISH	ICTALURIDAE	2	15	382	34.2	1
FLATHEAD CATFISH	ICTALURIDAE	2	22	200	28.5	
CHANNEL CATFISH	ICTALURIDAE	2	15	111	24.5	3
CYPRINUS CARPIO	CYPRINIDAE	2	2	1330	45.8	2
CYPRINUS CARPIO	CYPRINIDAE	2	2	972	40.0	1
REDHORSE	CATASTOMIDAE	2	14	642	37.2	1
REDHORSE	CATASTOMIDAE	2	14	624	38.1	2
REDHORSE	CATASTOMIDAE	2	14	766	38.8	1
REDHORSE	CATASTOMIDAE	2	14	732	40.3	2
REDHORSE	CATASTOMIDAE	2	14	724	38.5	1
REDHORSE	CATASTOMIDAE	2	14	550	36.6	1
REDHORSE	CATASTOMIDAE	2	14	562	36.2	1
CYPRINUS CARPIO	CYPRINIDAE	2	2	53	15.3	3
RIVER CARPSUCKER	CATASTOMIDAE	2	13	6	8.9	3
BLUEGILL SUNFISH	CENTRARCHIDAE	2	5	110	17.0	1
BLUEGILL SUNFISH	CENTRARCHIDAE	2	5	2	5.5	3
PIMEPAHLES	CYPRINIDAE	2	17	1	6.1	3
LONGNOSE GAR	LEPISOSTEIDAE	2	35	24	10.6	3
LONGNOSE GAR	LEPISOSTEIDAE	2	35	24	10.2	3
BLUEGILL SUNFISH	CENTRARCHIDAE	2	5	24	10.9	3
BLUEGILL SUNFISH	CENTRARCHIDAE	2	5	8	8.0	3
BLUEGILL SUNFISH	CENTRARCHIDAE	2	5	6	6.8	3

GIZZARD SHAD	CLUPEIDAE	3	1	15		11	3

Total	sums	sta.		gm/st.	cm/sta.
Station 1		1	85	22069	2228.0
Station 2		2	111	21620	2611.2
Station 3		3	154	14249	2398.1
	TOTAL		350	57956	7237.3
			#	weight	length
				gm/fish	cm/avg fish.
averages	ABOVE	one		259.6	26.2
	OUTFALL	two		194.8	23.5
	PADDY'S RUN	three		92.5	15.6
	TOTALS	TOTAL		165.6	20.7